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The U.S. Government's Global Hunger & Food Security Initiative

Innovation Lab for Nutrition- Asia
Purdue University Annual Report
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Feed the Future Nutrition Innovation Lab-Asia
Purdue University
Annual Report
Year 5 (2014-2015)

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Objective 1 (as stated in Year 5 implementation plan): Child Nutrition Data Analysis

Understand and measure the connections between agricultural capacity and performance, technology adoption, nutrition outcomes, and conditioning factors at levels of aggregation ranging from household to district levels. Develop an empirically-based and data-driven understanding of the overlap between agricultural issues and health/nutrition issues in Nepal, so as to improve the effectiveness of nutrition policy in Nepal.

Progress achieved, as detailed below.

Objective 2 (as stated in Year 5 implementation plan): Agricultural Price Analysis

In 2013, we worked with partners in the Ministry of Agriculture to obtain a very important set of monthly data on agricultural prices covering more than 45 districts and 20 commodities. The dataset consists of approximately 40,000 data points representing monthly observations of agricultural prices over the period 1998-2011. During Year 5, we designed and implemented protocols to connect these data to DHS and NLSS data to provide a more comprehensive view of the factors associated with child growth outcomes in Nepal.

Progress achieved, as detailed below.

Objective 3 (as stated in Year 5 implementation plan): Capacity Building

Increase the capacity and effectiveness of research institutions in Nepal and train students at the graduate level to become contributing members of the global community fighting against hunger and malnutrition.

Progress achieved, as detailed below.

Introduction/Overview of Work Plan Rationale/Objectives

Nepal faces a number of development challenges, including poor agricultural performance, chronic and widespread child malnutrition, inadequate infrastructure, and–in the wake of the 2015 earthquakes–post-disaster recovery and reconstruction. This Work Plan aims to study available evidence regarding food security, malnutrition and related topics in Nepal and to undertake primary research on key issues relating agriculture to nutritional outcomes, while simultaneously engaging in training to improve knowledge and capacity in Nepal. We attempt to work closely with the Managing Entity (ME) and project partners in Nepal to build new collaborations and strengthen existing collaborations with Nepalese partners around the topic of agriculture and nutrition. Work Plan activities are designed to be fully aligned with Nepal's Integrated Nutrition Plan (INP) goals and priorities as they relate to agriculture

Section I: Research Activities and Progress on Objectives 1 and 2

Focal area: *Discrete socio-economic analysis*

Activity 1: During Year 5 efforts continued to focus on generating research deliverables from prior investments of time and resources. In past years we secured access to a number of datasets, including multiple rounds of the Nepal Living Standards survey (NLSS), Nepal Demographic and Health Survey (DHS) data, and remotely-sensed satellite data (maximum value Advanced Very High Resolution Radiometer [AVHRR] Normalized Difference Vegetation Index [NDVI] composites from the NASA Global Inventory Monitoring and Modeling Systems. [GIMMS] group at NASA's Biospheric Sciences Branch). Working directly with Nepal's Central Bureau of Statistics, we successfully gained access to the most recent round of the NLSS data (2011). In Year 5 we made substantial progress on several fronts, including incorporating data on rainfall and infrastructure (including roads and bridges) to broaden the analysis. We maintained and accelerated momentum on analysis and writing, mostly in the context of Ganesh Thapa's PhD dissertation, which he will complete in December 2015. Keeping with our goal to develop useful data and make these data available to other members of the Nutrition Innovation Lab (NIL) research team, we released an analysis-ready dataset to project partners. We have developed a pipeline of research papers, some of which are in peer review, and some of which exist in working paper form. In previous years, two MS theses were completed at Purdue and a partnership with a graduate student at Tribhuvan University was successfully completed. These past efforts have created a pipeline of output that will continue to appear in coming years as it makes its way through the peer_review process.

Focal area: *Agricultural price analysis*

Activity 2: We obtained from the Ministry of Agriculture a large dataset consisting of agricultural market prices observed at monthly intervals in more than 45 Nepalese districts and seven Indian border markets. These data cover more than 20 important agricultural commodities and constitute approximately 40,000 price observations over the period 1998-2011. We have incorporated these data into our analysis of child growth, and are assessing the empirical evidence regarding the role of agricultural prices and price variability on nutrition outcomes. We have analyzed factors influencing price behavior as a way of identifying available and effective policy levers for influencing nutrition outcomes through sectoral and macroeconomic policy changes.

Lessons learned and challenges in implementing proposed activities

No impediments to progress at this time, although it is important to recognize that the peer-review process can be slow and cumbersome, leading to delays between the execution and appearance of research output.

Solutions/resolutions applied or to be applied

Section II: Capacity Building Activities

Focal area: *Degree training*

Activities: Ganesh Thapa began his PhD training in Agricultural Economics at Purdue in August 2012. Mr. Thapa successfully completed and defended his PhD prospectus in 2014 and is scheduled to defend his dissertation on November 16, 2015. Professor Patrick Webb (Tufts University) is serving as an outside committee member for Mr. Thapa. We are working to position Ganesh Thapa for successful completion of his PhD and reintegration to the academic and policy research community in Nepal. A second student, Celeste Sununtnasuk, completed her MS degree in Agricultural Economics at Purdue in May 2013. She worked extensively with Nepal DHS and NLSS data and joined IFPRI in Washington, DC where she continues to work on food security issues. Binod Khanal, an MS student at Tribhuvan University completed his degree in February 2013. Mr. Khanal undertook fieldwork with the support of a small NIL grant administered by Purdue and started his PhD work at the University of Nebraska in 2014. An additional Purdue MS student, Tim Smith, participated in NIL Nepal research and completed a thesis in 2014. His participation was provided as a cost-share to the project by Purdue. He is now enrolled in the PhD program in Agricultural Economics and continues to work on NIL-related issues.

Lessons learned and challenges in implementing proposed activities

Identifying well-prepared host-country students for graduate degree training in the US was a significant challenge. From a logistical point of view, early project delays and the substantial investment in student recruitment, screening and visa processing meant that we trained only one Nepalese graduate student. We face substantial challenges in identifying relevant post-graduation employment opportunities for Mr. Thapa in Nepal.

Solutions/resolutions applied or to be applied

We have made a commitment to support Mr. Thapa and are maintaining continuity of NIL funding to support him through completion of his degree in December 2015.

Outputs (not previously or elsewhere reported)

Shively, G., C. Sununtnasuk and M. Brown. "Environmental Variability and Child Growth in Nepal." Forthcoming in *Health and Place*.

Smith, T. and G. Shively. "Household vs. community determinants of child nutrition: a multilevel regression approach for Nepal." Draft manuscript in review.

Thapa, G. and G. Shively. "Food prices and market infrastructure in Nepal." Draft manuscript in review.

Leveraging and cost sharing

Substantial leveraging for Year 5 activities came in the form of NASA support for our collaboration with Dr. Molly Brown. While it is not possible to put an exact dollar amount on the value of this leveraging, Dr. Brown devoted substantial amounts of time to our efforts, served as an external committee member for one graduate student at Purdue, participated in a NIL-sponsored organized panel, and continues to collaborate on data analysis and writing. In our use of remotely-sensed vegetation data, we are creatively leveraging hundreds of millions of dollars in past US government investment in satellite data collection and processing. Additionally, Purdue University has supported two MS students who have contributed to project output.

Vignettes

The figure below is drawn from the article "Environmental Variability and Child Growth in Nepal," which is forthcoming in the journal *Health and Place*. That article attempts to draw connections between remotely-sensed data on local growing conditions (as indicated by the Normalized Difference Vegetation Index–NDVI) and subsequent measures of child nutrition outcomes (in the form of weight-for-height and height-for-age z-scores, or HAZ). We find that throughout the NDVI range in which normal values are observed–here roughly 400-800 in the Terai and 500-600 in the mountains—the relationship between WHZ and growing conditions are strongly positive. We see considerable WHZ sensitivity at the extremes of the NDVI distribution, however, and a substantial non-linear break in the observed association. The figure provided below underscores this sensitivity, where we restrict our attention to children 24 months and older to ensure a closer correspondence between agricultural output and the child's food consumption. NDVI anomalies during the growing season of a child's second year appear on the horizontal axis and HAZ appears on the vertical axis. Keeping in mind the important caveat that HAZ reflects outcomes from a cumulative process of health and nutrition shortfalls, these data suggest that HAZ is more broadly robust to departures from normality in the Terai, as one might expect given better agricultural, health and market infrastructure, than in the mountains, where both positive and negative departures from normality are associated with deleterious changes in HAZ. In short, nutrition seems more sensitive to growing conditions in the mountains than in the Terai, and far more sensitive to departures from normality. Additional research being undertaken as part of Ganesh Thapa's dissertation appears to suggest that, in part, the lower nutrition-sensitivity to environmental conditions that one sees in the Terai (vis-à-vis the mountains) emanates in part from better road and market networks that serve to buffer the pernicious effects of agricultural variability by improving market access and moderating food prices for households that are net-buyers of food.
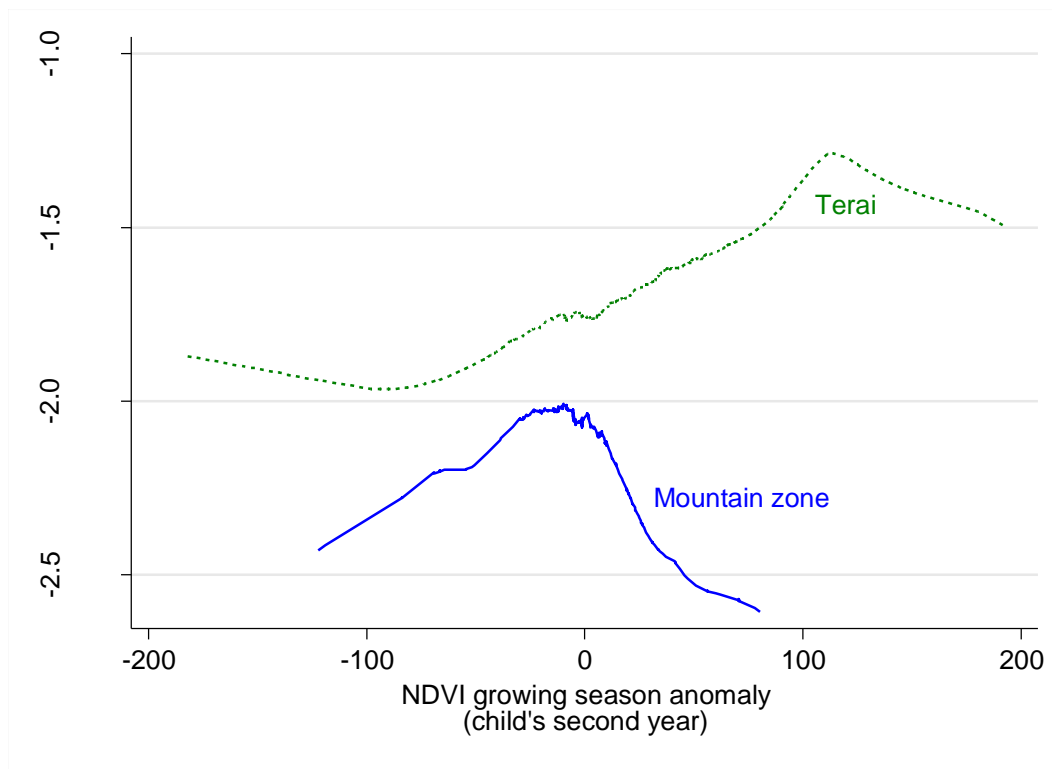
Lowess smoothed graph for HAZ (children > 24 months only) and NDVI growing season anomaly during child's second year, Mountain Zone (n=273) and Terai (n=556). Source: Figure 8 in Shively, G., Sununtnasuk, C., and Brown, M. (2015) "Environmental Variability and Child Growth in Nepal." Forthcoming in *Health and Place*.